CLAIMS

1. A coating composition comprising a film forming binder comprising

a. at least one polymer having pendant groups selected from the group consisting of hydroxyl, carboxyl, glycidyl, amine, amide, silane and mixtures thereof and having a glass transition temperature (Tg) of 10 to -80°C and wherein the pendant groups are reactive with the crosslinking agent c.;

b. a polytrimethylene ether diol having a Mn (number average molecular weight) of 500 to 5,000; and

c. a crosslinking component selected from the group consisting of organic polyisocyanates, melamine formaldehydes, alkylated melamine formaldehydes, benzoquanamine formaldehyde, urea formaldehyde, polyepoxides, silane resins and any mixtures thereof.

2. The coating composition of claim 1 wherein the polytrimethylene ether diol has a Mn 1,000 to 3,000, a Tg of approximately –75°C and a hydroxyl number of 20 to 200.

3. The coating composition of claim 1 wherein the binder comprises

a. 10 to 80% by weight of at least on polymer having pendant reactive groups,

b. 1 to 50% by weight of polytrimethylene ether diol,

c. 10 to 50% by weight of the crosslinking agent;

wherein the percentages are based on the weight of the binder and the sum of the percentages of a., b. and c. is 100%.

4. The coating composition of claim 3 wherein the polymer having reactive groups is an acrylic polymer wherein the reactive groups are selected from the group consisting of hydroxyl groups, carboxyl groups, glycidyl groups, amino groups, silane groups and any mixtures thereof.

5. The coating composition of claim 4 wherein the acrylic polymer has a weight average molecular weight of 5,000 – 50,000 and a Tg of 10°C to 80°C and consists essentially of polymerized monomers selected from the group consisting of linear alkyl (meth)acrylates having 1-12 carbon atoms in the alkyl group, cyclic or branched alkyl (meth)acrylates having 3-12 carbon atoms in the alkyl group, isobornyl (meth)acrylate, styrene, alpha methyl styrene, (meth)acrylonitrile, (meth)acryl amides, and polymerized monomers that provide groups reactive with isocyanate selected from the group consisting of hydroxy alkyl (meth)acrylates having 1 to 4 carbon atoms in the alkyl group, glycidyl (meth)acrylates, hydroxy amino alkyl(meth)acrylates having 1 to 4 carbon atoms in the alkyl group, alkoxy silyl alkyl (meth)acrylates and (meth)acrylic acid.

6. The coating composition of claim 5 wherein the acrylic polymer has a hydroxyl equivalent weight of 300 to 800 and consists essentially of polymerized monomers selected from the group consisting of alkyl (meth)acrylates having 1 to 12 carbon atoms in the alkyl group, isobornyl methacrylate styrene, alpha methyl styrene, (meth)acrylonitrile, (meth)acryl amides and mixtures thereof, and polymerized monomers consisting essentially of hydroxy alkyl (meth)acrylates having 1 to 4 carbon atoms in the alkyl group.

7. The coating composition of claim 6 wherein the acrylic polymer consists essentially of styrene, ethylhexyl methacrylate, isobornyl methacrylate and hydroxyethyl (meth)acrylate.

8. The coating composition of claim 3 wherein the crosslinking agent is an organic polyisocyanate selected from the group consisting of aliphatic polyisocyanates, cycloaliphatic polyisocyanates, aromatic polyisocyanates, trifunctional isocyanates and isocyanate adducts.

9. The coating composition of claim 3 in which the polyisocyanate is selected from the group consisting of isophorone diisocyanate, toluene diisocyanate, hexamethylene diisocyanate, diphenylmethane diisocyanate,

triphenyl triisocyanate, benzene triisocyanate, toluene triisocyanate and the trimer of hexamethylene diisocyanate.

10. The coating composition of claim 1 in which the polymer having pendant groups is a polyester having pendant groups selected from the group consisting of hydroxyl groups, carboxyl groups and mixtures thereof.

11. The coating composition of claim 1 in which the polymer having pendant groups is a polyesterurethane having pendant groups selected from the group consisting of hydroxyl groups, carboxyl groups and mixtures thereof.

12. The coating composition of claim 1 in which the polymer having pendant groups is a polyepoxy resin having pendant hydroxyl groups and epoxide groups.

13. The coating composition of claim 1 in which the polymer having pendant groups is polyetherurethane having pendant groups selected from the group consisting of hydroxyl groups, carboxyl groups and mixtures thereof.

14. The coating composition of claim 1 in which the polymer having pendant groups is a poly(meth)acrylamide.

15. The coating composition of claim 1 in which the polymer having pendant groups is a polyacrylourethane having pendant groups selected from the group consisting of hydroxyl groups, carboxyl groups and mixtures thereof.

16. The coating composition of claim 1 in which the polymer having pendant groups is a polycarbonate.

17. The coating composition of claim 3 containing an aminofunctional silane crosslinking agent having the formula

$$(X_n\ R)_aSi\text{-}(\text{-}OSi)_y\text{-}(OR^3)_b$$

wherein X is selected from the group consisting of $-NH_2$, $-NHR^4$, and SH, n is an integer from 1 to 5, R is a hydrocarbon group contain 1 to 22 carbon atoms, $R^3$is an alkyl group containing 1 to 8 carbon atoms, a is at least 1, y is from 0 to 20, b is at least 2 and R^4 is an alkyl group having 1 to 4 carbon atoms.

18. The coating composition of claim 17 containing an at least one additional amino functional compound selected from the group consisting of primary amines, secondary amines and tertiary amines.

19. The coating composition of claim 17 wherein the aminofunctional silane is selected from the group consisting of N-beta-(aminoethyl)–gamma-aminopropyl trimethoxy silane and diethylene triamino propylaminotrimethoxy silane.

20. The coating composition of claim 3 in which the crosslinking agent comprises melamine formaldehyde.

21. The coating composition of claim 3 in which the crosslinking agent comprise an alkylated melamine formaldehyde.

22. The coating composition of claim 3 in which the crosslinking agent comprise a benzoquanamine formaldehyde.

23. The coating composition of claim 3 in which the crosslinking agent comprise an urea formaldehyde.

24. The coating composition of claim 3 in which the crosslinking agent comprises a polyepoxide.

25. The coating composition of claim 3 in which the crosslinking agent comprises a silane resin.

26. The coating composition of claim 1 containing pigments in a pigment to binder weight ratio of 1/100 to 350/100.

27. The coating composition of claim 1 comprising in addition to the polytrimethylene ether diol, a branched or linear oligomer.

28. The coating composition of claim 1 wherein the polytrimethylene ether diol is formed via a bio conversion process.

29. A two component coating composition comprising

Component A of a polymer having pendant groups that are reactive with isocyanate moieties and having a glass transition temperature (Tg) of 10 to 80°C; and a polytrimethylene ether diol having a Mn (number average molecular weight) of 500 to 5,000; and

Component B an organic polyisocyanate crosslinking agent;

wherein Components A and B are thoroughly mixed together before application to a substrate.

30. A coating composition comprising a film forming binder of

a. at least one polymer having pendant groups selected from the group consisting of hydroxyl, carboxyl, glycidyl, amine, amide, silane and mixtures thereof and having a glass transition temperature (Tg) of 10 to 80°C and wherein the pendant groups are reactive with the crosslinking agent c.;

b. a copolymer of polytrimethylene ether diol having a Mn (number average molecular weight) of 500 to 5,000 comprising at least 50% by weight, based on the weight of the diol of polymerized 1,3-propanediol and up to 50%

by weight, based on the weight of the diol of another polymerized alkane diol; and

c. a crosslinking component selected from the group consisting of organic polyisocyanates, melamine formaldehydes, alkylated melamine formaldehydes, benzoquanamine formaldehyde, urea formaldehyde, polyepoxides, silane resins and any mixtures thereof.

31. The coating composition of claim 30 containing up to 60% by weight of solvent.

32. The coating composition of claim 30 wherein the copolymer of polytrimethylene ether diol has a Mn 1,000 to 3,000, a Tg of approximately –75°C and a hydroxyl number of 20 to 200.

33. The coating composition of claim 30 wherein the copolymer of polytrimethylene ether diol is a blend of high and low molecular weight ether diols wherein the high molecular weight diol has an Mn of 1,000 to 4,000 and the low molecular weight diol has an Mn of 150 to 500 and the average Mn of the blend is 1,000 to 3,000.

34. The coating composition of claim 30 wherein the polymer having pendant groups has a weight average molecular weight of 5,000 to 50,000 and a Tg of 30°C to 80°C and consists of an acrylic polymer consisting essentially of polymerized monomers selected from the group consisting of linear alkyl (meth)acrylates having 1 to12 carbon atoms in the alkyl group, cyclic or branched alkyl (meth)acrylates having 3 to 12 carbon atoms in the alkyl group, isobornyl (meth)acrylate, styrene, alpha methyl styrene, (meth)acrylonitrile, (meth)acryl amides, and polymerized monomers that provide groups reactive with isocyanate selected from the group consisting of hydroxy alkyl (meth)acrylates having 1 to 4 carbon atoms in the alkyl group, glycidyl (meth)acrylates, hydroxy amino alkyl(meth)acrylates having 1 to 4 carbon atoms in the alkyl group, alkoxy silyl alkyl (meth)acrylate and (meth)acrylic acid.

35. The coating composition of claim 34 wherein the acrylic polymer has a hydroxyl equivalent weight of 300 to 800 and consists essentially of polymerized monomers selected from the group consisting of alkyl (meth)acrylates having 1 to 12 carbon atoms in the alkyl group, isobornyl methacrylate styrene, alpha methyl styrene, (meth)acrylonitrile, (meth)acryl amides, and polymerized monomers consisting of hydroxy alkyl (meth)acrylates having 1 to 4 carbon atoms in the alkyl group.

36. The coating composition of claim 35 wherein the acrylic polymer consists essentially of styrene, ethylhexyl methacrylate, isobornyl methacrylate and hydroxyethyl (meth)acrylate.

37. The coating composition of claim 30 wherein the crosslinking component comprises a polyisocyanate selected from the group consisting of aliphatic polyisocyanates, cycloaliphatic polyisocyanates, aromatic polyisocyanates, trifunctional isocyanates and isocyanate adducts.

38. The coating composition of claim 30 containing pigments in a pigment to binder weight ratio of 1/100 to 300/100.

39. A coating composition comprising a binder comprising about 40 to 90% by weight, based on the weight of the binder, of polytrimethylene ether diol having a Mn (number average molecular weight) of 500 to 5,000 and 10 to 60 % by weight, based on the weight of the binder, of an organic polyisocyanate crosslinking agent.

40. A coated substrate which comprises a substrate coated with a layer of the coating composition of claim 1.

41. The coated substrate of claim 40 wherein the substrate is selected from the group consisting of steel and aluminum.

42. The coated substrate of claim 40 comprising a top coating selected from the group consisting of a clear coat/pigmented base coat and a pigmented topcoat.

43. A process which comprises applying a first layer of the composition of claim 1 to a substrate and drying said layer and applying at least on additional layer of a coating composition to the first layer and curing the layers.

44. The process of claim 43 wherein the at least one additional layer comprises a pigmented color coat and a clear coat.

45. A process which comprises applying a first layer of the composition of claim 30 to a substrate and drying said layer and applying at least on additional layer of a coating composition to the first layer and curing the layers.

46. The process of claim 45 wherein the at least one additional layer comprises a pigmented color coat and a clear coat.

47. A process for refinishing a damaged coating on a motor vehicle body which comprises applying a layer of the pigmented coating composition of claim 2 to damaged coating and at least partially curing the layer and then applying a second layer of a pigmented top coat or a layer of a pigmented base coat and a layer of a clear coat and curing all of the layers to form a finish.